

# **Worcester Commuter Rail Service Improvements Conceptual Design Report**

## **EXECUTIVE SUMMARY**

### **Project Purpose and Need**

The Massachusetts Bay Transportation Authority is evaluating track improvements to provide increased frequency of service on 23 miles of the Framingham/Worcester Line. This study evaluates the feasibility of the addition of a third freight rail track that would extend approximately 1.7 miles west from the CSX Nevins Yard in Framingham and approximately 4.3 miles east from the Worcester freight yard, with an additional ½ mile freight lead extension in Worcester Yard. The addition of a third track in these areas is intended to reduce capacity constraints on the CSX main track and would provide the opportunity for the MBTA to add more commuter trains to its existing service schedule. The goal of the Worcester Service Improvements Project is to increase mid-day service between Framingham and Worcester.

The existing Framingham/Worcester Line extends 44 miles from South Station in Boston to Union Station in Worcester. This line was one of the very early passenger lines in New England, with service commencing in 1835. Service to Worcester was suspended in 1975, although Framingham service continued. Service resumed to Worcester in 1994, as part of the Worcester Commuter Rail Extension. Ridership increases over the past 5 years have been significant, particularly at the newer western stations, and is forecasted to increase by 50% over the next decade, according to the results of the *Draft Final Report on the Worcester Service Expansion Study* (March 2003), prepared by KKO and Associates, LLC for the MBTA.

Commuter rail service on the line, also known as the Boston & Albany Line, operates on track owned by CSX between Framingham and Worcester. The Boston & Albany Line is owned and operated by CSX Transportation (CSX) railroad with the MBTA and Amtrak operating over this line under agreements with CSX. The Framingham/Worcester Line is the most frequently used freight line in New England. Due to growing demand for passenger service between the two largest cities in New England, the line was upgraded to a two-track system as part of the 1994 expansion of commuter rail service from Framingham to Worcester. The Framingham/Worcester commuter rail line is generally a 60 mph double-track railroad with a sophisticated signal system, which allows trains to operate on either track in either direction. A series of crossovers at interlockings or control points, allows trains to run around slower trains or around maintenance work on sections of track. The track structure is generally in good to excellent condition. In addition to MBTA commuter rail service and CSX freight service, the line also accommodates AMTRAK service operating to Albany, with connections to Springfield, New York City and Chicago.

The 1994 Worcester Commuter Rail Extension began operating with 6 trains per day from Framingham to Worcester. In 2001, this service was expanded to the current schedule of 10



round trip trains per day. Existing MBTA commuter rail service provides 20 round trip trains per day operating between Boston and Framingham, and, of these, 10 trains per day continue on to provide service to Worcester. Worcester area officials have pursued further improvements in commuter rail service to Union Station. The MBTA requested further expansion of service beyond the existing service agreements and authorized CSX to perform a capacity study in February 2003. This 2003 study recommended specific infrastructure investments to address capacity constraints identified by CSX. Subsequently, MBTA initiated this study to evaluate the CSX recommendations. In two sets of public and stakeholder meetings early in this project, conducted in both Framingham and Worcester in June and July of 2004, community representatives and the public have also expressed a strong belief that there is demand to support increased service to Worcester and the other stations west of Framingham.

Peak period service to Boston from Worcester (peak direction) operates on headways of 30 to 40 minutes in the A.M. peak and headways of 20 to 50 minutes in the P.M. peak. However, inbound service from Worcester to Boston operates at headways of every 2 to 3 hours during the mid-day and extending through the afternoon-evening peak period (non-peak direction). This compares to off-peak inbound service from Framingham that operates on headways of between 45 minutes and 105 minutes. In the outbound direction, off-peak service from Boston to Worcester operates on headways of 3 to 4 hours during the morning and mid-day, compared to headways of 1 to 2 hours for Framingham service.

Gaps in mid-day service can be attributed to conflicts with freight staging movements at CSX rail yards at Nevins Yard, west of Framingham Station, in Framingham and at Worcester Yard at the west end of the line. This Worcester Service Improvements Project examines track improvements on 6.5 miles of track at critical freight leads to minimize conflicts with freight traffic at CSX rail yard at Nevins Yard in Framingham and Worcester Yard. This study evaluates the addition of track in two segments: 1.7 miles of track extending west from Nevins Yard in Framingham to Control Point (CP) 24 in Ashland and 4.3 miles of track extending east from Worcester Yard through Millbury to CP39 in Grafton (plus the ½-mile yard lead).

These track extensions are the minimum level of improvement that CSX identified in the *MBTA Worcester Service Study* (July 2003) as necessary to allow mid-day service to Worcester to be increased. According to the CSX study, these track improvements would allow the MBTA to add 4 commuter trains per day to the MBTA schedule (2 round trip trains). Of course, the actual level of commuter rail service to Worcester is dependent on negotiations with CSX, which owns and controls the line.

## **Project Description**

### **Background**

This report examines the minimum amount of track improvements outlined in the CSX study. Initial consideration was given to adding a third track along the entire 23 miles between



Framingham and Worcester. However, this would require substantial capital improvements, including major modifications to recently constructed commuter rail stations at Ashland, Southborough, Westborough, and Grafton. This would also involve considerably greater environmental impacts, with construction required through the Westborough Cedar Swamp Area of Environmental Concern and the Grafton State Hospital National Register District. The service level improvements that would be provided with these track improvements are not commensurate with the substantial cost and impacts that would be involved. The scope for the current study focused on the track additions at the critical yard leads in Framingham and Worcester that would give CSX the added capacity necessary to allow the addition of commuter trains.

### **Ashland-Framingham Segment**

In Framingham, the proposal is to extend the Third Iron from Nevins Yard west (from CP23) towards Ashland to the existing universal crossover interlocking at CP24 and establish a new connection to Track 1 at that point. That would allow even the longest trains to pull completely off the Main Line while assembling train sets in Nevins Yard, minimizing potential interference with the passenger operation. These freight train movements for assembling train sets can occupy up to more than a mile of track. Two options were evaluated for the connection near CP24 in Ashland: Option 1 would tie in east of the Main Street grade crossing and Option 2 would extend west towards CP24, involving a second grade crossing. Option 1 has been identified as the preferred option.

Available right-of-way is generally on the south side of the tracks in Ashland-Framingham, so the track addition would be accommodated on the south side of the existing tracks. Track 1 now occupies the outbound (north) side, and Track 2 occupies the inbound (south) side. In the future, the added track on the south would be designated as Track 2, accommodating inbound trains, existing Track 2 would become Track 1 (accommodating outbound trains), and the existing Track 1 on the north would accommodate all freight movements from Nevins Yard for assembling train sets. Through freight movements would still be accommodated on Tracks 1 and 2, but freight movements for assembling trainsets, which can occupy the track for a few hours at a time, will be entirely shifted to the northern freight lead.

In the Ashland-Framingham project segment, the tracks would be located on the existing maintenance road, and minimal grading would be required to accommodate the track addition. This section of track extends largely through Ashland, extending over Main Street at an at-grade crossing, under Fountain Street, and over the Sudbury River and Framingham Reservoir No. 2 (Brackett Reservoir). In Framingham, a section of track closely borders on Framingham Reservoir No. 2. The overhead and undergrade bridges also have sufficient width to accommodate the track additions, and no major culvert modifications are anticipated.

The track improvements along the Ashland-Framingham segment will involve the following:



- Terminating track improvements east of the Main Street grade crossing is identified as the preferred option (Option 1) over a connection at CP24 and an additional grade crossing at Main Street (Option 2). This design modification will require CSX approval.
- Installation of short ballast retaining walls (or headwalls) on top of bridges at the Sudbury River and Framingham Reservoir No. 2 are proposed. At the Framingham Reservoir No.2 Bridge (also known as the Sudbury River Bridge at Milepost 23.54), replacement of the bridge wingwalls on the same footprint is proposed. Replacement of the bridge wingwalls at the Framingham Reservoir No. 2 Bridge will involve temporary alterations to approximately 200 square feet of land under water and approximately 40 linear feet of bank. This work in the waterway will require filing of a Notice of Intent under the Massachusetts Wetlands Protection Act and coordination with the Massachusetts Department of Conservation and Recreation (MDCR), which has jurisdiction over Framingham Reservoir No. 2. No permanent alterations are anticipated as a result of this work.
- Where the tracks extend in close proximity to Framingham Reservoir No. 2 in Framingham, a 250-foot long retaining wall, 15 feet in height, is proposed to minimize incursions into the embankment adjoining the reservoir (Option 1). Alternatively, the two existing tracks could be realigned to avoid work in proximity to the reservoir (Option 2). This work under Option 1 may involve temporary alterations to approximately 160 linear feet of bank regulated under the Massachusetts Wetlands Protection Act, requiring a filing of Notice of Intent. Coordination with MDCR will also be required.
- Work will occur adjacent to an Estimated Habitat/Priority Habitat for a state species of special concern at the Sudbury River Bridge, but no work will occur within the Sudbury River. This work will require coordination with the Massachusetts Natural Heritage and Endangered Species Program to comply with the Massachusetts Endangered Species Act.
- Utilities relocations include potentially relocating the fiber-optic communications system (owned by Sprint) that extends along approximately 3,900 feet of this project segment. Either this system could be relocated during construction, or a spare (empty) conduit could be installed offset from the tracks for future use in case there are problems with the fiber-optic system installed below the tracks after track construction. Research on existing CSX utility agreements will be needed to determine the responsible party for the costs of utility relocations.
- Track realignments will affect approximately 4,110 square feet of property that largely adjoins parking for the Ashland Technology Center. This may affect the parking capacity of this lot, although most of the land affected consists of grassed buffer between the railroad and the parking lot.
- The total cost of the Framingham-Ashland segment is approximately \$5.8 million.



## **Worcester-Millbury-Grafton Segment**

The proposed change at Worcester is to provide a third track east of CP43 all the way to CP39 in Millbury/Grafton. This will alleviate the need for CSX to occupy Main Line Track 2 at Worcester and would allow MBTA and Amtrak trains to have double track all the way to CP44. In the Worcester area, both sides of the right-of-way are constrained, and the east end yard lead on the south side of Tracks 1 and 2 will be extended, with the track addition on the south side along most of this project segment. Where other constraints exist at bridge crossings, all three tracks would be relocated.

Along this segment, with the track addition, the freight movements for assembling trains could all be accommodated on the southernmost track, and designations for existing Tracks 1 and 2 will remain the same. These Main Line tracks (Tracks 1 and 2) will continue to accommodate through movements of MBTA rail passenger cars, Amtrak inter-city service, and through freight traffic. Additionally, in Worcester, CSX has asked for an extension of the east freight track yard lead approximately one-half mile to allow simultaneous moves to and from the intermodal yard. This lead should tie in east of the new crossover from Track 2 to the east end yard lead, which accommodates traffic to and from the intermodal yard. This will allow simultaneous moves to the Worcester Yard and intermodal tracks.

This section of track extends largely through Worcester and through portions of Millbury and Grafton, to the south and east. Roadways that cross over or under the track include, from west to east, Putnam Lane, Plantation Street, Hamilton Street, Sunderland Road, and U.S. Route 20. Properties that border on the south side of the track in Worcester include the Ecotarium, a non-profit, privately owned museum and nature center; North High School; and Perkins Farm Conservation Area. In the Worcester-Millbury-Grafton project segment, the right-of-way is severely constrained, with ledge cuts, embankment slopes, high-voltage utility poles, and, in a few cases, bridge abutments extending to the edge of the existing tracks. Substantial modifications at crossing bridges will be required at Plantation Street, Hamilton Street, and Sunderland Road, and all fourteen crossing culverts will require lengthening, modifications, and possibly replacement.

The proposed track improvements along the Worcester-Millbury-Grafton segment would involve the following:

- The Putnam Lane Bridge, which extends under the railroad, may require strengthening to accommodate the additional track and train loads.
- Ledge excavation will be required at the overhead Plantation Street Bridge to accommodate the track addition.
- Modifications at the overhead Hamilton Street Bridge will involve either: ledge excavation, relocation of the west bridge abutment by 10 feet, and superstructure and wingwall replacement (Option 1) or realignment of all three tracks through this section and ledge excavation (Option 2).



- Modifications at the Sunderland Road Bridge will involve widening on the east side of the existing undergrade bridge and realignments of all three tracks to accommodate the track addition on the east side. The track addition on the east side is proposed, due to inadequate vertical clearance on the west side of the bridge. This track realignment would also accommodate the additional track further south on the available east bay of the U.S. Route 20 Bridge. Another option to be considered at Sunderland Road would be to lower the roadway profile.
- Extensive ledge excavation will be required to accommodate the track addition on the south side, as ledge adjoins significant portions of the rail corridor. It is anticipated that the ledge excavation would account for approximately \$9.8 million of the total costs along this project segment.
- Thirty-two retaining walls are shown in this report to avoid to the maximum extent possible property and environmental impacts along the Worcester-Millbury-Grafton segment. Retaining walls are the single most expensive item, accounting for approximately \$19.1 million. Since a conservative approach was taken in this study to location of retaining walls, it is recommended that further design reevaluate the need for retaining walls vs. property takings, based on the current use and type of property affected. Additional property takings that do not impair the current use of the property may result in substantial cost savings for retaining wall construction, but may also result in additional impacts and regulatory and permitting requirements.
- Extensive utilities relocations will be required. There is a high-voltage transmission system operated by National Grid that adjoins a substantial portion of the corridor. It is anticipated that either 39 or 45 of these high-voltage utility poles would be relocated, at an estimated cost of approximately \$4.9 to \$5.6 million, respectively. Approximately 1,750 feet of the fiber optic system (owned by Sprint) will be affected by track improvements. The affected lines could be relocated, or, alternatively, a spare, empty conduit installed alongside potentially affected areas. CSX utility agreements will need to be researched to determine the responsible party for the costs of this relocation.
- The retaining wall construction will minimize property impacts, but this construction will also affect approximately 5,800 square feet of property within four parcels that consist either of industrial property or undevelopable land adjoining the railroad (ledge). These property takings involve strip takings and will not affect the current or future use of the properties. Installation of the walls will also require temporary easements on a number of properties.
- Retaining walls will minimize wetland impacts, but permanent alterations are anticipated to approximately 4,700 square feet of bordering vegetated wetland and approximately 300 square feet of isolated wetland. Temporary impacts to approximately 315 square feet will occur with retaining wall construction. Permanent impacts will be mitigated through creation of wetlands replication areas. Permitting is anticipated to include a Notice of Intent under the Massachusetts Wetlands Protection Act and a U.S. Army Corps of Engineers Programmatic General Permit (Category 2, reporting).





- Work will occur adjacent to an Estimated Habitat for a state-threatened species at the Perkins Farm Conservation Area. This will require review by the Massachusetts Natural Heritage and Endangered Species Program in accordance with the Massachusetts Endangered Species Act. No permanent alterations to this conservation property will occur due to a proposed retaining wall, but retaining wall installation may incur temporary impacts.
- The total cost of this project segment is estimated to be approximately \$61.4 million.

In addition to the track improvements evaluated under the current study for the Worcester-Millbury-Grafton project segment, several other options have been identified for further consideration, given the substantial cost and extent of infrastructure modifications required (to bridges, retaining walls, ledge, utilities, culverts) to accommodate the track improvements. These other options are as follows:

- **Option to Terminate Yard Lead 6,000 feet East of Worcester Yard:** Although extending the third track all the way to CP39 would allow CSX freight trains to clear the main line sooner, it would be a very expensive arrangement and would involve considerable impacts. An option to consider would be to reduce the amount of track extension by terminating the track extension approximately 6,000 feet east of the yard. This is based on the minimum track length to accommodate CSX staging and assembling of trains from Worcester Yard, which would be equal to doubling of the longest track in the yard. Most of the ledge impacts occur in this section of track, so substantial rock excavation and retaining wall construction would still be required. Eliminating CP39 and creating an interlocking at CP42 could further improve this arrangement.
- **Options West of Worcester Yard:** Options west of Worcester Yard may provide improvements in CSX freight service at substantially lower costs. An example of improvements might include track lead extensions at the west end of the CSX Worcester Yard. These options could be implemented in addition to, or in lieu of, improvements to the Worcester Yard lead.

## Recommendations

It is recommended that the Ashland-Framingham and Worcester-Millbury-Grafton project segments be advanced as separate and independent projects in a two-pronged approach, given the complexity of the issues in the Worcester-Millbury-Grafton segment. These projects have independent utility and can be designed, permitted, and developed separately. This approach is recommended based on the longer lead time for development of designs, the extent of modifications required, and coordination needed to advance the Worcester-Millbury-Grafton portion of the project. Planning and design for the Worcester-Millbury-Grafton segment will require coordination with MassHighway for bridge modifications, the utility companies for major utility relocations, and affected property owners for installation of retaining walls. Development of this project segment will also require additional geotechnical investigations for ledge cuts and retaining walls. Moreover, further consideration of other design options identified in this report



(Option to terminate yard lead 6,000 feet east of Worcester Yard and Options west of Worcester Yard) for the Worcester-Millbury-Grafton section may be warranted, since the service level benefits associated with the longer track extension to CP 39 may not justify the considerable costs and impacts involved.

Coordination with CSX is needed to gain concurrence on assumptions made in this study regarding the conceptual designs for the track improvements (including use of 13-foot track center spacing) and other options identified for further consideration. Ultimately, agreement with CSX will be needed as far as the type of track improvement proposed and the number of additional trains that could be accommodated with the proposed track improvements.

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